British Waterways

THIRD PARTY WORKS' PROCEDURES SECTION 3

DESIGN GUIDANCE

April 2012

British Waterways

CONTENTS

1	INTRODUCTION	3
2	BRIDGES	4
3	SERVICE CROSSINGS	9
4	WATER DISCHARGE, ABSTRACTION & TRANSFER	15
5	INSTALLATION OF SERVICES IN THE TOWING PATH	21
6	WORKING IN THE VICINITY OF THE SKY BROADBAND TELECOMMUNICATIONS NETWORK	25
7	NON-MOORING BASINS, ON-LINE MOORINGS AND RIVER NAVIGATION MARINAS	27
8	SITE INVESTIGATIONS	32
9	DEMOLITION	35
10	MAINTENANCE	36
11	DIVING OPERATIONS	37
12	HYDROPOWER AND LEISURE FACILITIES REQUIRING WATER ABSTRACTION	38
13	MAXIMUM LOAD APPLICATION ON TOWPATH	42
14	SCAFFOLDING REQUIREMENTS	44

1 INTRODUCTION

1.1 Purpose of this Design Guidance document

1.1.1 This Design Guidance document is to give guidance and advice to Developers, Local Authorities, Statutory Undertakers and their consultants, Contractors, Voluntary groups, Householders or any other individual's or groups wishing to carry out Works for their purposes, which may or will affect the Waterways. This Guidance will help safeguard the interests of British Waterways in protecting the Waterway.

1.1.2 The basis on any relationship with any organisation (being the third party) wishing to undertake works on British Waterways canals and rivers and/or gain access over these waterways is set out in *Section 1*, *The Promoter's Guide*; *Section 2, Code of Practice; Section 4, Documents* and all should be read in conjunction with this Guidance.

1.1.3 British Waterways has a separate process to facilitate new canal marina (enclosed basin and lay-by) developments by providing specialist information. This is accessed via the link www.britishwaterways.co.uk/marinadevelopment and is managed by a dedicated British Waterways team, the New Marinas Unit (NMU). (Please refer to Section 7 of this Code for definitions and for information relating to non-mooring basins, on-line moorings and river navigation marinas).

1.1.4 The guidance given in this document is not comprehensive but will assist the promoter, designer, contractor, etc. to deliver works that meet the unique circumstance of the waterway environment and meet the challenges in dealing with the many diverse structures and users of it.

1.1.5 This *Design Guidance* document is subject to periodic review and Promoters should satisfy themselves that their copy of the Guidance is the most up to date issue. It is an uncontrolled document.

1.1.6 This document sets out to identify the criteria that British Waterways uses in evaluating any permanent works constructed alongside or over the waterway. It also includes for temporary works such as scaffolding that may be used to carry out any construction or maintenance. The Guidance must of course be read in conjunction with current industry standards, codes of practice, applicable regulations and its status is purely advisory.

2 BRIDGES

2.1 Introduction

2.1.1 This section refers to new bridges, bridge widening, major bridge refurbishment temporary bridges and conveyors.

2.1.2 Proposals for constructing new bridges or altering existing bridges across Waterways are conducted in four distinct phases:

- feasibility
- design
- construction
- maintenance

2.1.3 Feasibility and design are essentially iterations of the same process. Within this document these steps are not listed separately. It is imperative that all pertinent aspects relating to the interests of British Waterways are identified at an early stage.

There are aspects of construction and future maintenance, which need to be considered at the feasibility and design stages.

2.2 Feasibility and Design

2.2.1 The bridge site should be selected by considering the needs of the proposed scheme and also the effect of the bridge on the canal corridor. The latter criterion will include consideration of the following:

- navigational needs: locations adjacent to existing locks, bridges, bends etc. should be avoided where possible
- environmental and landscape impact on the canal corridor
- the needs of towing-path users (including those with disabilities); vehicles may be used for towing-path maintenance or access
- the protection and/or relocation of services in the towing path
- deterrence of vandalism.

2.2.2 The use of Design and Build contractors needs careful consideration. Unless the critical parameters are defined before a contractor is appointed, an unsatisfactory result and/or escalating costs to the Promoter will result. The concept should be considered as 'Detail and Build' not 'Design as you Build'. The Promoter remains responsible for the proposals.

2.2.3 Navigational clearances need to be established. These will vary from navigation to navigation and from site to site owing to considerations of craft dimensions, one or two way boat working, horizontal alignment and visibility, proximity to other structures, dredging and other maintenance activities. In each case the

2.2.4 The Works Engineer will define the following:

- headroom over navigation
- headroom over towing-path
- navigation width
- towing-path width
- navigation depth
- forward visibility.

Headroom will normally be defined relative to maximum navigable flood level on river navigations or overflow weir level on a canal. On river navigations the clearance must be maintained over the full width of the navigation channel.

In mining subsidence areas, a means of maintaining headroom such as jacking plinths, must be provided.

Minimised headroom leads to difficulty in maintaining the Waterway and building and maintaining the bridge. These problems include:

- temporary works clearances during construction
- temporary works clearances during maintenance
- access for dredging plant.

If sufficient headroom for these purposes cannot be achieved, a low maintenance structure is needed.

Dredging can sometimes be addressed by separating carriageways, or by providing alternative means of dredging other than the use of waterborne plant.

In order to maximise the time before dredging becomes required it may be necessary to dredge before construction.

Where dredging occurs, ensure that the dredged material that requires disposal is done so in an environmental and sustainable manner and in compliance with current legislation for contaminated material.

Headroom clearances relating to arched bridges need careful consideration. A profile, which will achieve the desired visual and clearance objectives, is needed. It is usual to use parabolic arches, with raised and set back spring points to achieve the optimum result.

Super elevated roads requiring bridges with less than generous headroom should be avoided, because of safety considerations. Boaters can be misled regarding the clearance and be unprepared for the headroom reduction.

2.2.5 The Works Engineer may require physical or mathematical modelling of the navigation to ensure that safe passage of craft can be maintained at all times.

2.2.6 If the Works Engineer permits any narrowing of the canal, such narrowing will normally take place symmetrically about the centre line of the navigation. The alignment of the canal banks is of particular interest to British Waterways. The drawings must illustrate a sufficient length of the canal to enable the realignment works to be viewed in context.

2.2.7 Consideration must be given to aspects of the forward visibility for navigators and towing-path users. It may, for instance, be necessary to increase the span of a bridge when a new structure is constructed in the vicinity of a bend on the navigation.

If it is essential to build bridges in close proximity to locks it may be desirable to increase the vertical clearance or install open parapet rails in order that vessels approaching the lock from below can determine in advance if the lock is in use.

2.2.8 Bridges across river navigations should generally clear the navigation in a single span. Where it is necessary to have piers within the river, special attention will be needed to ensure that such piers have a minimal effect on the navigation and are adequately fendered, signed and lit. Aspects to be considered include:

- clearances
- proximity to adjacent structures
- speed of flow in flood conditions & scour protection
- fendering.

2.2.9 Construction methods and the effect on navigation must be considered at the design stage. The

towpath should generally pass under the same span as the navigation.

The towpath under the bridge should be surfaced in material consistent with the character of the Waterway. Surfacing (including gradients, crossfall or width) should not hinder the use of the path by people with disabilities and should offer access compatible with or superior to surrounding towpath.

2.2.10 Weep holes should be laid to a backfall with drainage at the rear of the abutment.

2.2.11 In urban areas, where pigeon nuisance is a problem, the matter should be addressed through appropriate detailing.

2.2.12 Towpath accesses from highways must be retained and should be improved or provided where appropriate. These should be enhanced for people with disabilities, where possible and appropriate.

2.2.13 There should be no 'dead areas' prone to vandalism in towing-paths under bridges.

2.2.14 It is preferable that there be no pedestrian access to offside abutments of canal bridges in order to prevent graffiti.

2.2.15 Bridges over 15 m in length will be treated as tunnels as far as safety precautions are concerned.

2.2.16 It will generally be necessary to provide bank protection, durable for the life of the bridge, under the new bridge owing to considerations of:

- increased navigation depth
- difficulty in installing such protection later in limited headroom circumstance
- protection of the structure from scour
- fendering
- support to the towing path
- the new bank protection must interface with the existing with a detail designed to minimise the possibility of erosion and leakage at this point.

Piles should be capped to match the local vernacular.

Mitigation measures may be needed where bank protection results in damage to wildlife habitats.

2.2.17 Bridge abutments and spans have been found to be ideal bat roosts, especially where there are small crevices leading to voids within the structure. It is an offence, intentionally or recklessly, to damage or destroy any structure used by bats, or to disturb them whilst occupying the structure. Professional surveys of existing structures are recommended at an early stage of any widening or refurbishment scheme to avoid delays. Where possible the provision of bat habitat within or near to bridges should be considered in bridge design.

2.2.18 The noise impact upon the canal environment resulting from the new bridge crossing must be considered. If noise levels are too great mitigation measures must be introduced.

2.2.19 It may be necessary to erect noise mounds or barriers. It will generally be preferable to have solid parapets.

2.3 Aesthetics

2.3.1 The impact of the bridge on the canal environment will require detailed consultation. Not only are bridge aesthetics of great importance but also the setting of the bridge on the local and wider landscape must be considered. Off site planting should be considered.

2.3.2 When considering the aesthetics of the bridge there are two main options. The bridge should either be a striking dramatic modern structure or it should reflect the scale, style material, proportions and heritage of the navigation as a whole. In either case British Waterways requires a high quality, well designed and detailed proposal.

2.3.3 The waterway corridor is a linear one. Bridges are seen by waterway users as part of a sequence of structures, most of which are contemporary with the construction of the waterway. Users view bridges at leisure whether travelling on foot, at walking pace from a boat, fishing at close quarters or from a distance.

2.3.4 Aspects which will be discussed with regard to bridge aesthetics include:

- expression of function e.g. a beam bridge should not have false arch facades
- Scale - proportions and mass
- order - avoid chaos
- materials and facings. There is a presumption towards an appropriate brick or stone. The facing material and bond pattern, which will reflect local themes, must be selected in agreement with British Waterways before a contractor is appointed. Where appropriate, the incorporation of recycled materials should be considered by the Promoter. The sourcing of local materials is also important in achieving a sustainable project
- colour
- architectural features such as string courses, pilasters, pilaster caps and patterned brickwork; it is important that the bridge expresses its structural form and that such architectural features are inherent in the design and not 'add-on extras'
- parapet type:-open parapets allow road users to view of the canal and have the advantage of a weight saving over masonry parapets. On small scale canal bridges solid parapets are usually appropriate. In some cases it may be appropriate to "box in" an open parapet above the deck with masonry parapets above the wing walls – the 'masonry book-end': in areas of high vandalism special measures will be needed to protect waterway visitors from abuse
- wingwall direction and skew angle: the wingwall direction should generally be parallel to the transport mode being carried across the canal; wingwalls to skewed bridges must not be parallel with the canal; traditionally wingwalls are curved in plan and battered; consideration should be given to curved wing walls particularly on pastiche structures.
- the effect of road alignment and super-elevation
- embankment landscaping, which should be integral with the design of the bridge; native plants appropriate to the area and location should be used; if possible the planting should be carried out in advance of the works and should extend beyond the site to provide screening
- street lighting
- bridge name/number and date plates
- parapet/approach safety fence interface
- towing-path lighting where appropriate
- access ramps, steps, barriers, gates, stiles etc.

Computer generated images of proposed bridges gives an excellent view of the impact of new structures on the landscape and should be provided where necessary or on request.

Further reading on bridge aesthetics is available as follows:

Highways Agency	'*The Appearance of Bridges and other Highway Structures*' HMSO (1996)
Graham Tilly	*'Conservation of Bridges'* (Gifford / Highways Agency) Spon (2002)
Fritz Leonhardt	*'Brücken Bridges - Aesthetics and Design'* - Architectural Press (1982)
Conference papers	'*The Architecture of Bridge Design'* (1994)
Conference papers	'*The Aesthetic Refurbishment of Bridges'* (1995)
Conference papers	'*Good Looking Bridges'* (1993)

2.4 Construction

2.4.1 The design of the structure should take into account the bridge construction method.

2.4.2 Continuity of navigation and towing-path usage is presumed. Stoppages to navigation are only permissible if the works cannot be undertaken without disruption to navigation traffic. The need for such stoppages must be identified and agreed at the design stage. It may be possible, in some circumstances, where it is necessary in the interests of safety or otherwise, to carry out a local towing-path diversion. Such a diversion should be safe, commodious, maintained and signed. Pedestrians should be allowed to use the towing-path as soon as it becomes possible for them so to do.

2.4.3 Bed profiling should be carried out before and after the works in order to confirm that construction debris is removed.

2.4.4 It is usually possible to place bridge beams without interfering with traffic, by performing the lifts in the intervals between passing boats. In such circumstances a method statement will need to be agreed with the Works Engineer. Lookouts must be provided. The presumption is that canal traffic should not be delayed. Construction taking place adjacent to and above the navigation must be carried out with the clearances specified at the design stage. Fendering, lighting, screening and signing will be necessary where appropriate.

2.4.5 Experience indicates that piling lines, which are acceptable on a drawing, are not satisfactory on site, without minor amendment. It is imperative therefore that all piling lines are agreed with the Works Engineer before piles are driven.

2.4.6 Throughout the construction phase all possible measures should be taken to reduce environmental impacts on the waterway and surroundings. Particular attention should be given to protecting the waterway environment and associated flora and fauna.

2.5 Maintenance

2.5.1 The bridge should be designed to minimise the need for future maintenance to those parts of the bridge, which affect navigation and to address how essential maintenance is to be carried out without affecting the interests of British Waterways.

Where permanent access gantries are provided, a full operational agreement with British Waterways is needed, even where there are generous navigation clearances. A safe system of work must be agreed, incorporating, where necessary, lookouts, catch nets etc. British Waterways must be advised when access gantries are to be used.

2.5.2 Method statements, programmes and temporary works drawings must be agreed before carrying out any significant aspects of bridge maintenance.

2.5.3 Hard and soft landscaping must be maintained in accordance with a predefined plan.

3 SERVICE CROSSINGS

3.1 Introduction

This section refers to all services (e.g. pipes, cables etc.) installed on British Waterways' land parallel to and crossing the waterway, either overhead or beneath. See paragraph 5 for services beneath the towing-path.

This section primarily relates to canals, where considerations of integrity and water tightness are paramount. Some aspects are however relevant to river navigations.

3.1.1 Proposals for the installation, enlargement or maintenance of underground services should be considered in the following distinct phases:

- feasibility
- design
- construction
- maintenance.

Feasibility and design are essentially iterations of the same process, and therefore the steps are not listed separately in this document. It is imperative that all relevant issues relating to the interests of British Waterways are identified at an early stage. Also there are aspects of construction and future maintenance which need to be considered at the feasibility and design stages.

3.1.2 Overhead crossings are not permissible on environmental grounds. Whenever the opportunity arises to remove an existing pipe bridge, for instance when it is in need of renewal, the service will be diverted under the waterway.

3.1.3 Crossings will normally be perpendicular to the waterway.

3.1.4 A number of techniques are available which enable the installation of services below ground. These techniques range from trenchless techniques to open excavation (including the 'overlapping cofferdam' method).

3.1.5 Trenchless techniques will be presumed, but if such methods are not possible because of the particular site conditions, overlapping cofferdams or in particularly difficult circumstances trenching through a dewatered section of canal may be considered. However, attention is drawn to the standard stoppage conditions.

3.1.6 In some circumstances it may be possible to carry services in the surfacing over bridges, be they owned by British Waterways or others. It may also be possible to install ducts between beams. The option of external attachment should not be considered. British Waterways would raise strong objections on environmental, aesthetic and bridge maintenance grounds. There is usually minimal cover over bridges. Services must be laid on sand to distribute loads. Services are likely to be disrupted by bridge maintenance.

3.1.7 General technical requirements for a variety of systems are given below. These notes are not exhaustive and each installation will be considered on a case by case basis.

3.1.8 Marker posts should be provided at the rear of the towing path and on the offside.

3.2 Feasibility & Design - All Techniques

3.2.1 In principle, services should be installed with minimum of disruption to the Waterway, either during construction or during subsequent maintenance and use. In addition, normal operational activities such as bank protection and dredging should not be hindered by the presence of such installations.

3.2.2 The service crossing site should be selected by considering presumed or actual ground conditions, existing infrastructure and the needs of the underground service.

3.2.3 A site investigation will be required, involving a minimum of two boreholes (one on each side of the canal) to a minimum depth of 10 m or 3 m below the anticipated invert depth of the crossing, whichever is deeper. A depth profile across the full width of the canal or river will be required, showing the depth of water, the depth of silt and the level and material of the hard bed of the canal. The information should be related not only to Ordnance Datum but also to canal weir level, or in the case of a river low summer level. In mining subsidence areas the canal can be over 10 m deep, sometimes part filled with loose unconsolidated settlement.

3.2.4 Because of their industrial heritage, land in the corridor of some waterways, including bed silts, may be contaminated. A contamination assessment is necessary before any works are carried out which involve the excavation or disturbance of potentially contaminated materials. Consultation with the Environment Agency (or Scottish Environment Protection Agency) is recommended.

3.2.5 It should not be assumed that there is any impermeable lining in the canal.

3.2.6 A drawing showing the boreholes, bed survey information and the profile of the service and a description and interpretation of the ground model, based on the site investigation, should be produced for the Submission.

3.2.7 After receiving copies of the logs of the boreholes, bed survey and such other information as he or she may require the Works Engineer shall inform the Promoter whether the proposed method of construction can be considered and, if so, if the proposed depth is acceptable. The depth given at this stage may be modified by the Works Engineer depending on the soil strata revealed in the thrust and reception pits, in trenchless systems or during piling for open excavations. If the method is not permitted or if the Promoter considers the depth too great, he should submit an alternative method of construction for the Works Engineer's consideration.

3.2.8 Before any disturbance is caused to the canal structure, the Works Engineer may require a line of permanent interlocking steel sheet piles or reinforced vegetative bank protection, usually for at least 5 metres either side of the centreline of the crossing to be installed to each side of the canal. This permanent piling may be required to provide an area of protection within the canal bank against possible leakage or breaching, or to relieve the need to pile subsequently in the vicinity of the crossing. Where piling is essential for design reasons it may be appropriate that they be hidden for landscape and environmental reasons. Permanent sheet piling must be agreed with the Works Engineer as to length, section, depth, alignment, capping, ties, anchors and marrying-in with any existing canal bank protection and shall be shown on the approved drawings.

3.2.9 Permanent piling or walling, such as specified bank protection, must be designed by a competent person to withstand all external forces. The Works Engineer may require calculations. These calculations should clearly give design details of both the permanent and temporary conditions.

3.2.10 A suitable valve system, to enable a rapid shut down to be effected in the case of emergency, shall be provided where appropriate. The valves are to be fixed at least 5 m clear of British Waterways' land. Any sleeve or carrier pipe shall be capable of withstanding all normal canal, towing path and access road loading, and must extend to 3 m beyond British Waterways' land.

3.2.11 Any concrete surround or sleeve must extend a distance or not less than 3 m beyond either water's edge.

3.2.12 All electricity, telecommunication, etc. cables should generally be placed within a strong and durable duct of galvanised steel, thick walled Polyethylene type or similar material. In the case of electricity cables, metallic ducts must be plastic lined. Normally all pipes will be grouted in position in the duct.

3.2.13 All pipes carrying pressurised material, which in the case of pipe failure may affect British Waterways' property, must at the Works Engineer's discretion be placed within a suitable sleeve

or duct.

3.3 Feasibility & Design - Trenchless Techniques

3.3.1 Trenchless techniques are accomplished without excavation or disturbance, therefore reducing the overall operational, maintenance and capital costs associated with projects, while also minimising environmental concerns.

3.3.2 The principal criterion of British Waterways is leakage from the canal. Very small settlements can often be accommodated in the absence of structures. The Works Engineer may request settlement calculations.

3.3.3 Directional drilling has proved successful for small diameter flexible services such as cables and water pipes in soft and hard ground. Difficulties have been experienced with larger bores needing multiple reams.

3.3.4 Auger boring can lead to the creation of voids in granular ground and collapse of the bed has occurred.

3.3.5 Success has been achieved with earth-pressure balance micro–tunnelling machines used under unlined canals in soft ground.

3.3.6 When man entry techniques are proposed the safety of the miners must be paramount. Draining and closure of the canal may have to be considered.

3.3.7 If compressed air working is envisaged, the possibility of a blow out disrupting the bed and lining must be considered.

3.3.8 Difficulties of accuracy of the bore have been experienced when pipe ramming.

3.3.9 Pipe bursting of existing culverts is not normally viable due to considerations of disrupting the bed and creating an annular leakage path through the rubble.

3.3.10 In trenchless systems, the minimum depth to the crown of the pipe shall be of the order of 3.5 metres below hard bed level. This dimension will be varied as necessary depending on ground and trenchless techniques.

3.3.11 No part of a thrust or reception pit or shaft is to be nearer than 5.0 metres to waters edge.

3.3.12 The method statement must consider and address possible eventualities, such as seepage or leakage from the canal.

3.3.13 Pits or shafts should be raised by at least 300 mm above maximum canal water level, so that, if water from the canal were to enter the bore, it would be contained. In directional drilling a bund may be needed to contain leakage.

3.3.14 Any Contractor carrying out boring operations must be a member of the relevant approved trade association (e.g. the Pipe Jacking Association).

3.3.15 Where blasting is deemed necessary for the construction of the service the Promoter shall submit a full method statement which includes blasting arrangements and impact details. Agreement with the Works Engineer will need to be reached on frequency limits and the predicted Peak Particle Velocities. Vibrograph monitoring will be required during the Works.

3.3.16 Generally, back grouting of overbreak is necessary. The details of the proposed grout mix, phasing and pressures must be agreed. Mixtures particularly injurious to an aquatic environment should not be considered, although all cement based grouts are potentially polluting due to their lime content. Under no circumstances shall the pressure be allowed to exceed overburden pressure. Grouting records should be submitted to the Works Engineer as work proceeds. Constant monitoring of grout-take should be maintained and if there is any evidence of grout leak to the canal, the operation should be suspended immediately.

If any leaks to the waterway are discovered they should be reported immediately to the Works Engineer who may have to inform the Environment Agency (or Scottish Environment Protection Agency).

3.4 Construction - Trenchless Techniques

3.4.1 The Works Engineer shall be given a minimum of 48 hours' notice to allow him or her to inspect:

- the location of sheet piling for the thrust and reception pits and their approach trenches before piling commences
- the completed thrust and reception pits
- the commencement of each bore
- the completed work before the contractor leaves the site.

A record of the penetration of each pile in the thrust and reception pits and approach trenches as described above shall be kept on site and made available to the Works Engineer on request.

3.4.2 Pumping from any bore or pit is to be carried out only with prior consent from the Works Engineer and if found necessary, it must be passed through a settling tank to determine whether an undue proportion of fines is being withdrawn. Hoses are to be taken over the top of shafts and under no circumstances are holes to be cut in the piles. No contaminated water must be re-circulated to the canal. Environment Agency (Scottish Environment Protection Agency in Scotland) consent for the disposal of this water may be required.

3.4.3 The boring and jacking operation once commenced is to be continuous and carried out in accordance with safe, standard practice. Unless otherwise agreed 24-hour working will be required.

Where pipe-jacking, pipe ramming or auguring techniques are employed, it is required that the progress of the bore be kept under constant supervision, distances from the head of the boring pit are to be painted at 500 mm intervals on the pipes. The points at which the pipe shall pass beneath each of the two canal banks and the deepest part of the canal are also to be indicated on the pipe.

3.4.4 Where an approved directional drilling technique is employed, constant monitoring shall be carried out in order to confirm the depth and alignment of the bore.

3.4.5 Surface monitoring of settlement will generally be required.

3.4.6 In no circumstances must an auger be projected forward of the jacking shield.

In the event of canal water appearing at the face of a tunnel or in the boring pit in remote techniques, work may continue if appropriate and whatever action is necessary must be taken, but the Works Engineer should be notified immediately. Face boards shall be available for boarding up the exposed face of a thrust bore or tunnel.

3.4.7 In the event of a bore proving abortive, work shall not be recommenced until after the Works Engineer has accepted alternative proposals. In such cases the pipe is to remain in position and be filled along with any overbreak with grout of an agreed mix.

3.4.8 The removal of piles and backfilling and adequate backfilling of pits employed within the Works and associated reinstatement is to be carried out to the satisfaction of the Works Engineer, in order that support is not lost.

3.4.9 The Works Engineer shall be empowered to order the work to be suspended at any stage for any express reason and this instruction must be acted upon immediately. The Works Engineer shall not accept any liability for any costs or claims, which may arise by the Promoter as a result.

3.4.10 The contractor shall install a permanent marker on both sides the waterway to indicate the line of the crossing. Details to be agreed with the Works Engineer

3.5 Feasibility & Design - Overlapping Cofferdam

3.5.1 Uninterrupted passage of craft on the Waterway is to be maintained at all times. The cofferdam is to be constructed in two stages using the overlapping method. In certain cases it may be necessary for some dredging to be carried out to ensure that a navigable channel is maintained around either the first or second stage of the cofferdam. The necessity for this shall be determined beforehand by taking soundings of the canal depth but under no circumstances should dredging be carried out without the agreement of the Works Engineer and then only under his or her supervision.

3.5.2 Where dredging is found to be necessary, consideration shall have to be given to the stability of banks or bank protection, which may need to be reinforced, modified or improved at the Promoter's expense.

3.5.3 All excavation support structures are to be designed by a competent person to withstand all external forces and to have adequate penetration below excavation level to resist heave and seepage of water into the excavation. The Works Engineer may require structural calculations.

All walling and struts shall be installed in a proper manner as the excavation proceeds. The tops of all temporary sheet piles shall be left above MAXIMUM canal water level to cater for flood flows and inundation.

3.5.4 Suitable buffers and fenders shall be provided to guide vessels into the diversion. Fenders and their supports are designed to resist the impact of a 40 tonne barge travelling at 4 mph.

3.5.5 The minimum acceptable navigable canal width is site specific and will be specified by the Works Engineer and is sufficiently wide for a single craft to pass at any one time.

3.5.6 In proposals adopting the overlapping cofferdam method, the design needs to take into account such matters as boat manoeuvrability, landing stages for delay during one-way working and the proximity of other navigational restrictions such as locks, alignment, visibility etc.

3.5.7 Steel, earthenware, fibrous concrete and plastic pipes must have a 300 mm concrete minimum surround.

3.6 Construction - Overlapping Cofferdam

3.6.1 A record of the size and penetration of each pile in any permanent sheet piling and in any cofferdam is to be kept and provided to the Works Engineer.

3.6.2 In addition to the signing requirements referred to in the Bye-Laws, reflective chevron marking plates shall be affixed to clearly identify the extremities of the fender which is to be placed as protection around the cofferdam as shown on British Waterways standard drawings.

3.6.3 All signs should be erected and maintained in a secure and prominent position clearly visible to navigators without obstructing the towing path or navigation.

3.6.4 Where traffic levels or visibility demand, one way working using signals or flags will be required.

3.6.5 Puddle clay should be from an approved source, should comply with the British Waterways Specification available on request from the Works Engineer and should be worked and placed using agreed techniques to the satisfaction of him or her.

3.6.6 Back fill to canal banks etc. should be adequately compacted to the satisfaction of the Works Engineer.

3.6.7 The removal or cutting off of temporary piles is to be carried out using an agreed technique to the satisfaction of the Works Engineer, so as not to have an adverse effect on the water tightness of the canal.

3.7 Maintenance - Overlapping Cofferdam

3.7.1 In cases where it has been necessary to replant a hedge, it shall be protected from grazing stock and maintained until established.

4 WATER DISCHARGE, ABSTRACTION & TRANSFER

This section is applicable to canals and navigable rivers where British Waterways is riparian owner and those navigations identified in Statutory Instrument No 1195 *'The Inland Waterways of the British Waterways Board Order 1965'* as amended. The requirements relating to navigation are applicable to other river navigations.

4.1 Water Discharge

4.1.1 Introduction

4.1.1.1 British Waterways is not a land drainage authority. Water levels in canals are maintained in dry spells using reservoirs, river abstractions, pumping from ground water sources and re-circulatory pumping at locks ('back pumping'). Water levels are controlled in wet periods using overflow weirs and manually controlled sluices. Without these, the canal would overtop and may breach its banks, causing damage to property and possible loss of life. When the canals were constructed, they were usually a closed system, isolated from the effects of storms. Therefore storm water discharges do not assist in dry periods and can cause severe difficulties in wet conditions. Where a new (or modified) discharge is proposed, it will be reviewed to determine if the benefits to BW outweigh the risks of acceptance and approval by Water Management and Environment Teams, the Waterway and the Utilities Team will be required.

4.1.1.2 British Waterways will use its *Mandatory Process on Reviewing & Approving Discharges* when considering proposals. This document will be made available to Promoters on request. The process entails the submission of an Outline and, if necessary, a Detailed Impact Assessment, by the Promoter.

4.1.1.3 It should not be assumed that an existing discharge can be retained when a site is redeveloped for a new use, if permission is given to retain and re-use an existing discharge a new commercial agreement will normally be required.

4.1.1.4 Promoters must submit the completed Appendix 4 (Outline Pollution Risk & Hydrological Assessment) to allow BW to consider a proposal for a new or modified discharge to its network. To assist the completion of Appendix 4, reference should be made to the *BW Surface Water Discharge Guidance – Producing an Outline and Detailed Impact Assessment*, which is available in Section 4 (Documents) of the Third Party Works' Procedures. The subsequent sections of this Chapter describe the three main aspects of consideration that BW undertakes, namely: flood risk, pollution/water quality risk and navigational impact.

4.1.2 Feasibility, Design, Operation & Maintenance – Flood Risk considerations

4.1.2.1 The only discharge which will normally be considered is uncontaminated surface water in small quantities at suitable locations.

4.1.2.2 British Waterways supports the principles of Sustainable Drainage Systems (SuDS) which should be followed. Guidance is given in the CIRIA publication C523 'Sustainable Urban Drainage Systems – Best Practice Manual' – This refers to the CIRIA Sustainable Urban Drainage Design Manuals C521 for Scotland and C522 for England and Wales. The Flood and Water Management Act 2010 introduces changes to the legislation relating to SuDS, and subsequent editions of this document will reflect those changes, once enacted/commenced.

4.1.2.3 The details of on-site flow attenuation measures (such as SuDS) giving details of design, information about storage or drainage of water in excess of attenuation should be provided as well as any details of maintenance and adoption agreements for SuDS. If the SUDS are not maintained in the long term, then they will fail to provide the design attenuation and British Waterways will be

exposed to the full un-attenuated additional flood risk. Any SuDS such as underground storage, ponds, soakaways, flow restrictors etc. must have a suitable maintenance regime in place to ensure their effective operation over the life expectancy of the development.

4.1.2.4 In addition to the above information, the details of the proposed connection with the canal should be provided together with an estimate of the peak velocity of the discharge orthogonal to boat movement.

4.1.2.5 Discharges are not usually permissible directly above and below locks, adjacent to moving bridges and at mooring sites. Navigational difficulties would ensue as a result of the transverse flows. In order to minimise navigational difficulties associated with transverse flows of water the discharge energy must be minimised in the discharge structure design or by storage. Discharge velocity generally must not exceed 0.3 m/s measured at 90° to the direction of the navigable channel.

4.1.2.6 Discharges into the Waterway may require consent from the Environment Agency (EA) or the Scottish Environment Protection Agency (SEPA). The Promoter will be responsible for obtaining any necessary consent and providing proof to the Works Engineer that this has been done. It must not be presumed that EA or SEPA consent confers British Waterways consent.

4.1.2.7 New developments must be designed in accordance with "Planning Policy Statement 25 (PPS25)" in England or "Technical Advice Note (TAN) 15" for Wales. These documents set out how flood risk is to be managed during the design and planning process.

4.1.2.8 If mitigation measures are required, it must be agreed at an early stage whether the new or modified structures are to be procured by British Waterways or the Promoter and which party will own and maintain them in the long term. It is usual that the structures are designed and built by the Promoter to an acceptable design and that British Waterways assumes long term responsibility for the water control structures only, on its own land, on acceptance of an agreed commuted sum.

4.1.2.9 Discharges are not usually permissible in short canal pounds between locks. Difficulties could result from the capacity of by-wash weirs, surcharging the pounds and dewatering for the maintenance of locks.

4.1.2.10 Discharges are not usually permissible directly above and below locks, adjacent to moving bridges and at mooring sites. Navigational difficulties would ensue as a result of the transverse flows. In order to minimise navigational difficulties associated with transverse flows of water the discharge energy must be minimised in the discharge structure design or by storage. The discharge velocity generally must not exceed 0.3 m/s measured at 90° to the direction of the navigable channel.

4.1.3 Feasibility, Design, Operation & Maintenance – Pollution/Water Quality considerations

4.1.3.1 British Waterways will not generally accept sewage or trade effluent. Only in exceptional circumstances where there is adequate treatment, evidence of a treatment plant maintenance schedule and adequate dilution will applications be considered.

4.1.3.2 Discharges into the Waterway may require consent from the Environment Agency or the Scottish Environmental Protection Agency. The Promoter will be responsible for obtaining any necessary permit and providing proof to the Works Engineer that this has been done. It must not be presumed that Environment Agency consent confers British Waterways consent.

4.1.3.3 Pollution control measures such as traps, gullies, oil separators, silt traps, swales or detention ponds will be required where appropriate. All pollution control measures should conform to the relevant Environment Agency publications and Pollution Prevention Guidance (PPG) notes. It is unlikely that these will be permitted to be built on land owned by British Waterways. Normal practice would be to construct them on the Promoters land with adequate access provided to allow them to be regularly maintained.

4.1.3.4 The Promoter must supply their long term maintenance plan, with emergency contact numbers for all oil separators, silt traps, swales and other pollution control devices for approval by British Waterways. Suitable isolating systems such as valves or stanks must be included at the design

stage, in to allow maintenance and provide protection to the receiving waterway from pollution incidents.

4.1.3.5 Where it is possible to do so at design stage, a representative sample of the proposed discharge water should be taken and analysed for appropriate parameters. The results should be supplied to the Works Engineer for consideration. In some cases an analysed sample of the water in the receiving canal will be required for the purpose of comparison.

4.1.3.6 During operation, it may be necessary to require that water samples are taken at intervals and analysed. It may be necessary for British Waterways or its agents to inspect from time to time the area drained to the Waterway to ensure that the pollution risks remain acceptable. Alternatively, it may be acceptable for the inspection to be carried out by the discharger using a standard self-assessment procedure.

4.1.3.7 Calculations and plans will be required for the drainage network. The plans should define the pipe runs and illustrate the uses to which the drained areas are to be put and any other factors that may affect the quality of the surface run-off.

4.1.3.8 Where water is discharged at a higher temperature to that of the normal canal water, consideration will have to be given to the environmental impact. This will involve modelling outputs, with consideration to: the size of the receiving waterway, flow, design of the discharge outlet, and hot water plume dispersal from the outfall. In some cases additional water may have to be passed along the waterway at the Promoters expense to give the required dilution of the discharge. Any additional water required for dilution will be treated as an abstraction, see Section 4.2 below and also included in the discharge quantity for design of mitigation measures.

4.1.4 Feasibility, Design, Operation & Maintenance – Navigational Impact considerations

4.1.4.1 The point of discharge is installed perpendicularly to the canal centre line in both axes. The point of discharge should not protrude past the surface of the canal wall such that it affects the mooring of a craft at the same location.

4.1.4.2 The pipe diameter for above water surface discharges is limited by the available distance between the normal water level and the underside of the coping stone. Several smaller pipes should be used where feasible.

4.1.4.3 The point of discharge must be installed such that water cannot flow from the canal or be abstracted using the point of discharge. For gravity discharges a stilling chamber / sand trap / oil interceptor is typically provided on the neighbouring land. For pumped discharges the discharge pipe is typically installed above normal canal water level to avoid siphoning.

4.1.4.4 At locations where craft will be manoeuvring at low speed the limit to the velocity of discharge will be reduced in proportion to the reduction in craft speed. The discharge velocity generally must not exceed 0.3 m/s measured at 90° to the direction of the navigable channel. The Works Engineer will specify the craft speed. A stilling basin is usually needed to comply with this requirement. In most cases physical or mathematical modelling will be necessary.

4.1.4.5 Scour protection may be needed.

4.1.4.6 Discharge structures should be designed to minimise the visual impact on the canal, to allow the quality of the discharge to be monitored and to prevent loss of water from the canal into the drainage system. The structure should be accessible in safety for maintenance and sampling. Where this is not possible, for instance on river navigations, a remote sampling point and a flap valve are needed. Outfall structures should normally be designed for the discharge to take place below the normal water surface, preferably via a stilling chamber arrangement, wherever practicable. Above surface outfalls are only accepted in exceptional circumstances, due to the visual impact and risk of navigational difficulties, although offside outfalls above surface are less likely to cause problems than towpath side.

4.1.4.7 Fendering and signing of structures may be necessary. In particular pumped discharges will need to be signed to advise waterway users of their intermittent operation.

4.1.4.8 Discharge structures should be capable of carrying the loads imposed by the use of the towing path maintenance vehicles.

4.1.4.9 Towpath levels should not be raised to accommodate pipework.

4.1.4.10 The discharge of water to canals can lead to the transfer of water in an open channel to waste weirs. In some instances the issues discussed below under 'Water Transfer' may be applicable.

4.2 Water Abstractions

4.2.1 Introduction

4.2.1.1 Under legislation (Transport Act 1962), British Waterways is allowed to sell untreated water which is surplus to its navigational requirements. British Waterways can also offer the use of canal water as a cost effective and eco-friendly way of cooling and/or heating waterside developments. Water abstraction is possible subject to the availability of water and by negotiating an acceptable charge. It may be appropriate to return a proportion of the abstracted water, as in the case of cooling and/or heating buildings where no contamination has been added. Where water is to be returned at a higher temperature to that of the normal canal water, consideration will have to be given to the environmental impact. This will involve issues such as the size of the canal, the normal flow along the canal, the design of the discharge and how the plume of hot water disperses downstream of the discharge. In some cases additional water may have to be passed along the canal at the Promoters expense to give the required dilution of the discharge.

Other points to note:

- The quality of water and the continuity of supply cannot be guaranteed
- Information regarding typical water quality can be supplied
- It may be necessary for maintenance and engineering purposes to de-water the canal. In such circumstances, it is usually possible to maintain continuity of water supply by over-pumping, however abstractions and discharges may have to cease if they are within the dewatered section, for the duration of the works.

Abstractions should be negotiated with the Head of Utilities or a member of the centrally based Utilities Team (*Section 4 Documents*, Appendix 3).

Internal consultations then take place with the relevant Waterway and Water Management Team to ensure that the abstraction is acceptable and installation works managed correctly. This will be the same for the return water in the case of water used for heating or cooling buildings.

4.2.1.2 Abstractions in England and Wales which take quantities of water greater than 20 m^3 per day will require a licence from the Environment Agency (Section 66 of the Water Resources Act 1991 as amended by the Water Act 2003). Abstraction Licences must be applied for, and are normally held, by British Waterways. There is a statutory process under the Water Resources Act 1991 involved in obtaining an Abstraction Licence which can take around 6 months to progress; it is not therefore usually possible to abstract larger quantities at short notice. A new licensing regime has now been set up for abstractions in Scotland and a licence may be required from the Scottish Environmental Protection Agency.

4.2.1.3 The abstraction flow rate is limited to 0.3 m/s. A 6 mm gauge mesh is placed before the abstraction pipe.

4.2.2 Feasibility and Design

4.2.2.1 Abstraction is not usually permissible from short canal pounds between locks, owing to the difficulty of maintaining levels.

4.2.2.2 Abstraction is not usually possible directly adjacent to locks, moving bridges and mooring sites owing to the navigational difficulties which would ensue.

4.2.2.3 Abstraction structures are normally required. The structures must have a facility to stop the abstraction flow and should have safe access for British Waterways staff at all times in order to cater for eventualities and emergencies. The design of the structure should facilitate de-watering for maintenance.

4.2.2.4 A safely accessible metering facility should be included.

4.2.2.5 The watertight lining to the canal will need to be appropriately modified to permit abstraction.

4.2.2.6 Scour protection may be needed.

Suitable isolating systems such as valves or stanks must be designed in to allow maintenance.

4.2.2.7 In order to minimise navigational difficulties associated with transverse velocities the maximum velocity of the abstracted flow must not exceed 0.3 m/s measured at 90^0 to the direction of the navigable channel. Where craft are manoeuvring at low speed this velocity will be reduced in proportion to the reduction in craft speed. The craft speed will be specified by the Works Engineer.

4.2.2.8 Measures may be needed to ensure that fish are not sucked in. An Environment Agency document *Diversion and Entrapment of Fish at Water Intakes and Outfalls,* by Dr DJ Solomon, NRA R&D Report No 1, July 1992 is available.

4.2.2.9 Signing and fendering may be needed.

4.2.2.10 Abstraction structures should be capable of carrying the loads imposed by the use of the towing path by maintenance vehicles.

4.2.2.11 Towing-path levels should not be raised.

4.2.2.12 The sale of water from canals leads to the transfer of water in an open channel from feeders or other water sources to the abstraction point. In some instances the issues discussed below under 'Water Transfer' may be applicable.

4.2.3 Maintenance

Grilles may be needed to prevent debris entering the system. Debris removed from the grilles should be disposed of promptly and not left on the canal side.

4.3 Water Transfer

4.3.1 Introduction

4.3.1.1 Where canals or rivers are being used to transfer significant volumes of water from one point to another, from a discharge to a weir, or from a feeder to an abstraction point, special consideration is needed. The works summarised below may be necessary:

- raising of freeboard levels to a degree to be agreed with the Works Engineer; considerations of the backwater curve indicate that there should be sufficient freeboard not only between the inlet to the canal and the outlet, but also beyond the outlet and in the other direction from the inlet
- where freeboard levels are to be increased and the canal is carried on an embankment (i.e. proposed water level is above the surrounding land on one or both banks), consideration should be given to the impact, if any on the stability of the embankment
- raising of bridges to give satisfactory clearances with the increased level associated with the hydraulic gradients; reduced headroom leads to serious dangers to boat users
- widening and deepening areas of restricted cross-section in order that flow velocity does not lead to navigational difficulties
- installing bank protection to prevent erosion associated with the flow
- raising of existing puddle clay, clay trenches or other measures to counteract leakage and increased seepage.

4.3.1.2 Modification works will cause a significant environmental impact and will require careful consideration. The environmental impact will not be restricted to the immediate effect of the Works since the changes in velocity and level and mixing of different water qualities may cause long term environmental effects, both in the waterway and in inter-connected rivers, reservoirs, groundwaters, etc. These will need to be assessed at the planning stage.

4.3.1.3 Consideration must be given to the consequences of interruption of the flow during for example Works of maintenance or construction.

5 INSTALLATION OF SERVICES IN THE TOWING PATH

Each site will be considered on its own merits. In order to protect the integrity of the structure of the canal and its environment, the following general guide-lines will apply.

5.1 Feasibility

5.1.1 A number of factors need to be considered when determining the most suitable depth and position for the trench. Such factors are likely to include the position of the waterway wall, existing hedges and trees, other plant and animal life (most commonly badgers and water voles) that may be affected, presence of invasive weeds such as Japanese Knotweed, structures, embankments, cuttings, canal lining (puddle clay or other), tie rods, the use of mooring spikes, surfacing, presence of contaminated land etc. Canal operations such as mooring points may also have an effect on the positioning of the trench.

5.1.2 Sufficient site surveys, geotechnical investigations and planning enquiries shall be undertaken to substantiate the proposed route and installation design.

5.1.3 The main environmental issues relate to disturbance or disposal of contaminated land, disturbance or damage to hedges, trees and wildlife, and spread of invasive weeds. Site surveys and desk studies will be needed to assess these issues to minimise environmental impact. Detailed guidance on these issues is available from British Waterways

5.2 Design

5.2.1 Access points and manholes shall be arranged so as to avoid linear access along the towing path for future laying and maintenance operations.

5.2.2 Where the nature of the apparatus is such that if punctured or damaged by a mooring spike or similar, and injury to Waterway visitors or damage to canal structures could occur, it will be necessary for the apparatus to be suitably protected to prevent such damage.

5.2.3 Outline installation programmes and factors to be incorporated in the order and method of construction and reinstatement shall be agreed with the Works Engineer and incorporated in the Contract Specifications, prior to the Promoter inviting Tenders.

5.2.4 Where Works are to be of phased construction, 7 days notice shall be given of commencement of each individual length within that phase.

5.2.5 Localised arrangements may have to be made to accommodate previously agreed third party or British Waterways works. Fishing clubs and other similar organisations likely to be affected by the Works should be consulted and if necessary appropriate action should be taken to accommodate them.

5.2.6 The line and depth of the trench should take account of the environmental constraints identified in the survey work and desk studies so as to minimise environmental impact.

5.3 Installation

All works should be carried out in accordance with National Joint Utilities Group Guidelines (e.g. NJUG Publication No. 10 – *Planning, Installation and Maintenance of Utility Services in Proximity to Trees*), which contains guidance on how to avoid damage to tree roots, and can also be used to avoid damage to hedgerow roots.

5.3.1 Access to working areas shall only be at locations agreed with the Works Engineer.

5.3.2 Vehicular access along the towing path will only be permitted when agreed by the Works Engineer. Appropriately sized plant should then be used and passage along the towing path kept to a minimum. In the interests of safety the maximum speed limit on the towing path is 5 mph.

5.3.3 The Works must not obstruct the use of and access to landing points at locks, moveable bridges and other such operational structures. Where this cannot be achieved, alternative temporary facilities must be provided.

5.3.4 The use of floating plant is to be encouraged.

5.3.5 British Waterways offers no right of support to the apparatus.

5.3.6 If required by the Works Engineer, bank protection must be repaired or installed to the design life of the apparatus. A suitable land drainage system may be required to drain the towing path surface.

5.3.7 The width of the trench shall be the minimum practical to allow proper laying and compaction of the apparatus.

5.3.8 When digging within embankments and cuttings, the absolute minimum of disturbance must occur. Adequate erosion and sediment control measures to reduce impact of activities must be installed.

5.3.9 Tie bars and back anchors to bank protection systems must remain undisturbed. If this is not possible, suitable arrangements for their replacement must be agreed with the Works Engineer.

5.3.10 The existing puddle clay or other impermeable lining and water-bars must remain undisturbed. Where this is not possible, suitable arrangements for their reinstatement must be agreed with the Works Engineer.

5.3.11 Trenches shall be properly compacted with suitable backfill to minimise surface settlement and measures taken to prevent the creation of seepage paths for the canal water. Where water is detected in the trench the Works Engineer must be notified immediately. Backfilling must not proceed until the Works Engineer has been informed and visited the site.

5.3.12 Puddle clay water bars must be provided at 100m intervals and at positions specified by the Works Engineer. In some locations, such as embankments, it may be necessary to backfill the trench along its length with puddle clay.

5.3.13 Marker tape placed above the apparatus is required. A trace wire embedded within the tape may be required to allow future detection of the apparatus. Marker slabs may also be required. Above ground markers may be required at suitable locations.

5.3.14 All materials shall be stored in such a way as to avoid overloading the canal structure, disrupting users, to minimise damage to towing path vegetation and to deter vandals. Pollution should be avoided by following the advice in the Environment Agency Pollution Prevention Guidance Note No 6 *Working at Construction and Demolition Sites*.

5.3.15 If ducts are to be dewatered, care should be taken in the disposal of the water as it can often be contaminated with silt, oil, or other substances. Discharge to the waterway or other surface waters are not favoured because of the pollution risks. No discharge to the waterway should occur without the permission of the Works Engineer. Guidance is given in the Environment Agency Pollution Prevention Guidance Note No. 20 *Dewatering of underground ducts and chambers*.

5.3.16 All surplus excavation material shall be removed from site unless prior consent has been given by the Works Engineer for on-site disposal or other use. Waste management legislation shall be complied with, including the need to take precautions to avoid the spread of Japanese Knotweed. Guidance on the latter is given in the Environment Agency leaflet *Guidance for control of invasive plants near watercourses.*

5.4 Towing Path Restoration

5.4.1 Duct laying should be concurrent with excavation and backfilling, so as to minimise the length of open excavation. Trenches in vulnerable locations shall be backfilled overnight.

5.4.2 Interim towing path restoration to a standard acceptable to the Works Engineer shall be completed within two weeks of initial excavation of the trench. Interim restoration should be signed as such to inform canal visitors.

5.4.3 Where a stoned path or better is damaged by the Works, an interim restoration of a path 1m x 75 mm thick, in well graded and compacted stone, to an agreed specification will be acceptable.

5.4.4 Previously unsurfaced paths damaged by the Works shall be restored to a condition that allows walking in 'country shoes'.

5.4.5 Opportunities should be taken to enhance access for people with disabilities where possible through appropriate surfacing, reduction in crossfall, etc.

5.4.6 Damage to vegetation should be minimised. Where restoration is necessary, native seed or plants of local provenance should be used. Species which reflect the local flora should be selected.

5.4.7 Final restoration shall be completed as soon as possible after installation and no later than three months from initial excavation. This may mean that reseeding or replanting may have to be put off until the growing season (March to October inclusive). Reinstatement works are to be undertaken carefully, in a manner agreed with the Works Engineer and are to be compatible with the age and style of the original or surrounding materials.

5.4.8 The full width of route disturbed by the Works is to be reinstated to a standard acceptable to the Works Engineer.

5.4.9 Brick paving, Breedon gravel or other high quality surfacing shall be reconstructed to the agreed specification over the full width of the path or lock/bridge landing disturbed by the Works. Recycled aggregates should be used, where possible for buried construction layers.

5.4.10 Unless otherwise specified by the Works Engineer, reinstatement shall be generally to the standards outlined in the Highway and Utilities Joint Committee Specification.

5.4.11 Manholes must be kept to a minimum size and be of an appropriate design aesthetically. The compaction of backfill around manholes is important. Manhole covers should be permanent, recessed and lockable. They should be of sufficient strength to withstand all anticipated traffic loading.

5.4.12 Buried manhole covers are preferred, particularly where access for all is possible. Marker posts are required. The Promoter will be required to replace any damaged or missing posts throughout the life span of the apparatus.

5.5 Installation Completion

5.5.1 British Waterways will respond to the issue of an Inspection notice confirming final restoration, within 21 days for each phase of the installation.

5.5.2 As-built drawings are required by the Works Engineer. The position of the trench must be indicated at 100m intervals and related to hard features including the waterway wall. Drawings must include the location of water bars and any other features installed or encountered as part of the Works.

5.5.3 Where hedgerows or trees are reinstated with new planting the Promoter may be required to maintain the new planting for a period of 12 months, replacing any dead or dying stock as required.

5.5.4 Upon completion of the Works, details of the safety procedures that should be followed in connection with the installed apparatus should be forwarded to the Works Engineer. Details of long term emergency contacts are required by the Works Engineer for inclusion in the British Waterways emergency procedures manuals.

6 WORKING IN THE VICINITY OF THE BRITISH SKY BROADBAND TELECOMMUNICATION SERVICES LTD NETWORK

6.1 Determination of Compliance with Procedures

6.1.1 The contractor shall notify the Works Engineer who in turn will notify the Utilities Business Team, based at Hatton, of any work that is to be undertaken in the vicinity of the British Sky Broadband Telecommunication Services Ltd network. This process should be actioned at the planning stage of the work, in conjunction with searches made to other utility companies. The correct procedure is laid down in the 'Service Level Agreement'.

6.2 Emergency Procedures

6.2.1 In the event of work classed as an emergency (leak stopping, bank slippage, etc.) requiring immediate attention, the Utilities Business Team should be contacted without delay; they will then contact British Sky Broadband Telecommunication Services Ltd and arrange a site inspection. If an emergency occurs out of normal working hours then the British Sky Broadband Telecommunication Services Ltd 24/7 emergency telephone number should be used (08000 273 242) and the Utilities Business Team Manager notified as soon as possible.

6.3 Service Level Agreement

6.3.1 To safeguard both British Waterways and British Sky Broadband Telecommunications Services Ltd interests, the *'Service Level Agreement'* should be understood and adhered to at all times. Any unauthorised deviation from that document could result in damage to the British Sky Broadband Telecommunication Services Ltd network and large compensation claims from its customers.

6.3.2 This agreement not only applies to the network installed underneath the towpaths but also to buildings and the services to the buildings owned by British Sky Broadband Telecommunication Services Ltd, such as PoP (Point of Presence) sites and booster stations.

6.4 Procedure

6.4.1 The procedure is aimed at all project managers, designers and contractors, including BW staff, BW contractors, third party works' contractors, local authority contractors and volunteers, for works that are being carried out on BW property on or adjacent to the British Sky Broadband Telecommunication Services Ltd network. The responsibility for ensuring this procedure is complied with rests with the project manager.

6.4.2 At the design stage a notification form, see *Section 4: Documents* Appendix 6 should be completed and sent to the Utilities Team. This form is the prompt to British Sky Broadband Telecommunication Services Ltd that work is required under, over or adjacent to their network. After being alerted by the notification form British Sky Broadband Telecommunication Services Ltd will contact the nominee, sending drawings and advice regarding working next to its network. The nominee will also be contacted directly by a British Sky Broadband Telecommunication Services Ltd representative to discuss the nature of the work and organise a site visit with all concerned.

6.4.3 A minimum of fourteen days notice should be given to British Sky Broadband Telecommunication Services Ltd before work is due to commence; and method statements and risk assessments should be submitted at this time.

6.4.4 A minimum of three months notice should be given to British Sky Broadband Telecommunication Services Ltd if, after meeting with British Sky Broadband Telecommunication Services Ltd at the design stage, it is recognised that a lift and shift operation must take place to the said network for the designated work to take place.

It should be stressed that no physical exploratory work on the site should be undertaken before a joint site visit with British Sky Broadband Telecommunication Services Ltd

7 NON-MOORING BASINS, ON-LINE MOORINGS AND RIVER NAVIGATION MARINAS

Whilst all the points below still need to be considered and addressed in any proposal, British Waterways now have a specific procedure for Promoters of new marinas and significant changes to existing marinas.

The Promoter of a Marina scheme should contact at an early stage:

New Marinas Unit
British Waterways
Fearns Wharf
Neptune Street
Leeds LS9 8PB

Tel: 0113 281 6800
E-Mail: nmuenquiries@britishwaterways.co.uk
Fax: 0113 281 6886

The Promoter will then be given advice on how to proceed, likely costs and timescales, and initial advice on the suitability of his or her proposals. It is expected that any scheme submitted for Planning Approval will already have been submitted to British Waterways under the procedure for new marinas, and have British Waterways' support.

There is a set procedure for the Promoter to follow, standard fees to pay at various stages, and this Code and its charges will not applied for purely marina proposals.

Where Promoters are including a marina proposal within a larger scheme, advice should be sought from the above address as to which aspects are covered under the new marinas procedure, and which may have to be considered with an application under this Code.

A Contract will have to be in place before any works commence on site.

7.1 Definitions

Non-mooring basin – a body of water connected to a British Waterways canal or river navigation without any facilities for mooring.

On-line moorings – moorings along the existing line of a British Waterways' canal or river navigation (i.e. without any widening of the navigation).

River navigation marina – a marina constructed with a connection to a British Waterways' river navigation.

Canal marina – a marina constructed with a connection to a British Waterways' canal .Refer to New Marinas Unit as above.

Lay-bys – moorings along the line of a British Waterways' canal facilitated by a widening of the navigation. Refer to New Marinas Unit as above.

7.2 Introduction

It is the policy of British Waterways to restrict the creation of new on line moorings and to seek to reduce existing on line moorings where new off line marinas are created. Where accommodation works are necessary to support the proposal, including the solution to consequential operational problems, these will be at the expense of the Promoter.

7.2.1 A Contract will be required to authorise the connection of a basin to the Waterway, or to authorise moorings alongside the navigation.

7.2.2 The proposal for any non-mooring basin, on-line mooring or river navigation marina will be considered in two distinct stages:

- feasibility during which the practicality and acceptability of the proposition will be considered and discussed
- design and construction wherein all matters relating to the design, detailing, construction and operation will be the subject of a Submission.

7.3 Feasibility

7.3.1 In order to assess the impact of the proposals on the adjoining navigations Waterways may require specific information. This may include:

- numbers, dimensions, type (i.e. private, trip boats, hire boats, day boats, commercial carriers etc.) and use of craft
- details of drinking water supply, refuse and sewerage disposal for craft
- details of vehicle parking and access
- information on boat sales and repair, fuelling, chandlery and restaurants
- details of measures that are intended to protect water quality and to contain pollution generated from within the basin and from associated land-based facilities that may drain into the basin
- access for all, including those with disabilities.

7.3.2 It will normally be necessary to obtain Planning Permission for such schemes; a written environmental statement is usually necessary, as well as written confirmation from British Waterways that the proposals are acceptable in principle. Developments in the flood plain require Environment Agency (Scottish Environment Protection Agency in Scotland) consent. Preliminary consultations with the Environment Agency are recommended to avoid delays. Land Drainage Consent may also be required by the Environment Agency for works within 8 m of a designated Main River.

7.3.3 Certain sizes of non-mooring basins or river navigation marinas may require a formal Environmental Impact Assessment under planning regulations. Anything over 1,000 m² of water space may be covered at the discretion of the local planning authority.

7.3.4 British Waterways will consider the effect on current and future traffic boat traffic (including its consequential impact on the waterway environment), navigation safety, water supply, the type of moorings proposed, the provision of supporting facilities and environmental effects. A water resource study, to determine if the navigation can support the generated traffic, may be called for. The environmental impact of additional traffic resulting from the development will depend on existing levels of boat traffic and the extent to which they will increase. Waterways with low levels of traffic are often of high ecological value, with some designated as SSSIs. In these cases Natural England (or Countryside Council for Wales or Scottish Natural Heritage) will need to be consulted.

7.3.5 In the case of proposals from riparian owners on river navigations, British Waterways consent as the Statutorily designated Navigation Authority must be obtained. British Waterways may have statutory rights, which it may be necessary to preserve or accommodate.

7.3.6 The Promoter should, during early consultation stages, submit 6 copies of a Preliminary General Arrangement drawing detailing the proposed configuration of the moorings and a Site Location Plan. Both drawings should be of sufficient scale and area to enable the site and proposals to be clearly identifiable.

A copy of the General Arrangement Drawing will be returned to the Promoter together with a schedule of information that is required for the Submission together with any initial comments.

7.3.7 All levels shown on the General Arrangement shall be to Ordnance Datum and must show the water levels in the navigation. All land ownership encompassed by the proposals, together with those adjoining, must be shown, along with the layout of the various facilities.

7.3.8 Ground investigations should include the following information where the proposal connects to or interferes with the impermeable lining of an artificial cut or canalised navigation:-

- location and depth of all boreholes and trial pits
- full log of boreholes and pits including description and classification of soils and ground water levels
- location and depth of samples
- an interpreted ground model with quantitative information on characteristics such as plasticity index, permeability (horizontal and vertical), classification by particle size distribution, angle of friction, cohesion and dispersivity index
- ground levels not only to Ordnance Datum but also relative to normal water level in the canal and, where appropriate, levels of flood defences, maximum flood, mean low water of spring and neap tides and mean high water of spring and neap tides
- quantitative information on contaminated land and ground water, where applicable. the works engineer may require water quality monitoring during construction and subsequently during operation.

7.3.9 The site investigation is to be carried out in accordance with BS 5930 (1999) and testing to BS 1377 (1990). British Waterways is particularly concerned that the integrity and water-tightness of the canal are not compromised. For this reason, the required information should be obtained by a soils survey and site investigation specialist. The continuity of the bed clay or other lining in the non-mooring basin or on-line mooring with that in the canal is of extreme importance. The main canal bed in the area of the junction must be profiled in order that the junction can be designed to provide sufficient depth for navigation and continuity of the lining.

7.3.10 The Promoter should present the results of the investigations in the form of a report which should be submitted to the Works Engineer. The report should contain a description of the ground model, highlighting any geotechnical hazards and including a geotechnical risk register. The Works Engineer will then advise on the need for puddle clay or other impermeable barrier within the mooring area, together with any other constructional requirements. Thereafter the Submission should follow the requirements and conditions of *Section 2: Code of Practice.*

7.3.11 A basin, which contains more than 25000 m^3 water and is raised above the level of the surrounding land may be a 'Large Raised Reservoir' under the Reservoirs Act 1975 and will need to be designed, constructed, inspected and supervised by members of the appropriate Panels.

7.3.12 Consideration must be given to the nature of land being used to create the non-mooring basins, on-line moorings or river navigation marinas. Areas such as boggy or scrubby low-lying land adjacent to waterways are often of significant value for wildlife, and could contain protected species such as Great Crested Newts, Water Voles etc. Such areas should be avoided or new developments designed so as to retain a significant portion of the area of value, or to include other adequate mitigation measures.

7.4 Design & Construction

7.4.1 In the case of a non-mooring basin or river navigation marina with a connection to an artificial cut the following requirements will apply:

- the basin must be sealed, except in impermeable ground, with a durable membrane to ensure that the water supply to the navigation is not adversely affected by leakage into the surrounding strata; the method of sealing will be of great importance and will be considered in conjunction with proposed construction methods and future maintenance, including dredging; if the adjacent or underlying land is contaminated, the seal must also prevent contamination entering the waterway.

  In the case of marinas on river navigations the need to seal the basin does not apply. If, however, the navigation can be drained for maintenance or by failure of any embankment, it will be the responsibility of the Promoter to decide whether or not to protect the craft in the basin

- uplift should be considered for lined basins in areas of high or fluctuating groundwater level
- where contamination is considered to be a risk, the stilling test should be used as an opportunity to test for leaching into the basin
- on completion of the construction of the non-mooring basin and before connection to the navigation, the Promoter will be required to fill the basin with water up to the navigation level; a stilling test will then be carried out; the basin will be isolated from the canal by double stop planks and the space between the planks will be pumped out; all pumps, syphons etc. must then be removed and over a period of 28 days thereafter, or for so long as the Works Engineer deems necessary, the loss of water level in the basin from all sources, including evaporation, will be monitored to ensure that it is not excessive
- the non-mooring basin or river navigation marina should be separated from the main navigation by an undisturbed berm that is lined and armoured as appropriate in order that the entrance cannot be by-passed by water
- the entrance to the non-mooring basin or river navigation marina should generally be no wider than the standard lock gauge of the navigation unless manoeuvring of boats requires it
- the entrance to the basin should be constructed to protect the integrity of the navigation and should form an impermeable seal; a reinforced concrete invert slab is required at the entrance, together with two sets of stop planks and associated grooves and cills; for the further protection of the canal, the outer and inner toes of the entrance slab shall be piled to prevent undermining of the slab by scouring; the stop planks must be stored and maintained ready for use adjacent to the entrance at all times; the walls of the entrance should be steel piling, mass or reinforced concrete, masonry or brickwork. In the case of marinas on river navigations the need to seal the basin does not apply. If, however, the navigation can be drained for maintenance or by failure of any embankment, it will be the responsibility of the Promoter to decide whether or not to protect the craft in the basin
- it is a requirement of the Bye-Laws that craft entering or leaving a marina or non-mooring basin, or turning, should not impede or endanger craft in the main channel; to satisfy this, particular attention will be given to proposals for the entrance to ensure the design is such that the sight lines are acceptable and that they are not obscured by craft moored on that frontage; there must also be sufficient water space for craft to execute the turn or to hold until the channel is clear for them to proceed
- where towing path continuity, rights of way or other protected rights of access are to be maintained over an entrance to any non-mooring basin or river navigation marina, the Promoter shall be required to construct, and maintain, a bridge over that entrance capable of carrying the traffic needing to use that route (including disabled people where appropriate); navigation clearances under the bridge are to be provided to enable craft of maximum dimensions plus a clearance to pass through; the bridge must be aesthetically appropriate to the Waterway environment
- in order to prevent scour of the towing path or bank opposite the entrance by the wash of craft turning into or out of the non-mooring basin or river navigation marina entrance the Works Engineer may require that the Promoter undertakes or pay for appropriate protection works to that bank
- the method of bank protection used should take account of ecological, aesthetic and heritage issues

- any future changes requiring an extension of the non-mooring basin or river navigation marina or alterations to the seal, after the initial consent, must be the subject of re-application and consultation.

7.4.2 Where the proposal relates to a river for which the British Waterways has responsibility as Navigation Authority, the Consent of the British Waterways will be required for all parts of the proposal that are considered to affect navigation safety.

7.4.3 All structures must be protected where necessary by fendering designed and installed to resist the impact of moving craft, vertical movements of water level due to flooding or tides and to protect the hulls and superstructures of craft from damage.

8 SITE INVESTIGATIONS

Site investigation is a requirement for the majority of works covered by this code, and the information arising forms a key part of the assessment by British Waterways of the overall submission. It is therefore important that the level and quality of information is consistent with the complexity of the proposed works. The site investigation should be sufficient to reduce the risks associated with unforeseen ground conditions to a tolerable level.

In line with industry practice, the site investigation should be under the overall supervision of a Ground Specialist (ICE 1993), who should have appropriate experience of the type of development proposed. The investigation must be carried out to the standards defined in BS 5930 (1999) as a minimum: where a departure from the standard is used, justification must be provided. Soil testing must be carried out to BS 1377 (1990), by a UKAS accredited laboratory.

Attention is drawn to the fact that, for the purposes of the Construction, Design and Management Regulations (1994), site investigation is considered to be a construction activity. Compliance with the regulations must be ensured by the promoter.

8.1 The Ground Model

8.1.1 The overriding objective of the investigation is to produce a ground model, against which predictions may be made regarding the ground response to the proposed works. The ground model requires interpretation of the geology, ground conditions including groundwater and other factors (including existing structures), by a suitably qualified and experienced person; normally this will be a geotechnical engineer or engineering geologist.

8.1.2 The ground model should be described clearly using plans, cross-sections, block diagrams and other sketches as appropriate. Areas of assumption or interpolation should be clearly identified.

8.2 Geotechnical Desk Study

8.2.1 The site investigation should include a desk study phase, which should include a walk-over survey of the site. It is often found that reference to historic maps provides useful information on the history of development of a waterway site, particularly in more developed areas.

8.2.2 The desk study should include:

- an initial ground model
- recommendations for further investigation as appropriate, to further define the ground model
- a preliminary geotechnical hazard list and risk register, which should be updated throughout the later phases of investigation.

8.3 Ground Investigation

8.3.1 Prior to commencing the ground investigation, all borehole/ trial hole positions and accesses should be agreed with the Works Engineer, and checked for positive identification of any services or other underground structures. A check should also be made for recorded archaeological sites, and the listed status of any structures which may be affected, together with any land designation (such as SSSI status). Details of the proposed investigation, together with any environmental or heritage impacts, must be included in the environmental appraisal for the site (see section 2).

8.3.2 Care should be taken not to disturb wildlife when carrying out any intrusive investigations (boreholes, trial pits, etc). Of the wildlife most likely to be encountered, badgers (and their setts), nesting birds, bats, water voles and all reptiles require special attention as they are all legally protected.

8.3.3 No borehole shall be drilled or trial pit excavated within five metres of the water's edge or within the water channel without the written permission of the Works Engineer. Normally, this would only be necessary where it is required to determine the composition and properties of the bed/ lining material, to assess whether the lining extends behind the bank protection, or to locate services or other buried structures.

8.3.4 Waterway walls are not structural retaining walls, merely erosion protection. They are often up to two hundred years old. Plant should be lightweight only and physically restrained from approaching the edge of the canal. A condition survey and risk assessment will be required.

8.3.5 The impermeable lining to the canal should be identified, located and avoided where at all possible. However, if it will be necessary to affect the navigation channel, within the existing Waterway width, for temporary or permanent works, then bed profiling for a sufficient distance either side of the Works should be carried out. In such cases where it is necessary to carry out bed profiles, and/or identify bed materials, impermeable linings etc, any investigations must be agreed in detail with the Works Engineer in order to minimise the risk of damage to the canal. The Works Engineer may reserve the right to carry out these investigations using his or her own contractor at the Promoter's expense.

Other constraints which must be observed are:

- At no time shall the Waterway or towing-path be blocked. Signage and suitable fencing or other barriers must be used to segregate the public from the working area
- No trial pits are to be excavated on embankment slopes below the level of the canal or within five metres of the toe of such embankments
- No water is to be pumped into or out of the canal
- No borehole or trial pit spoil or grout shall be allowed to enter the canal and all such arisings shall be removed from British Waterways' property in compliance with waste management legislation
- Boreholes are to be sealed and backfilled with cement-bentonite grout of an agreed specification. Where alternative backfilling is required (for example for a particular installation), this is to be by prior agreement
- Trial pits are to be carefully backfilled and adequately compacted in layers
- Any variations from these constraints require the written agreement of the Works Engineer.

8.4 Reinstatement

All access roads used, and fences and hedges disturbed during the investigation are to be fully reinstated to the Works Engineer's satisfaction. The Works Engineer may reserve the right to carry out such work using British Waterways own contractor at the Promoter's expense.

Where it is necessary to leave apparatus such as piezometers or survey stations on British Waterways' land, the design of the installations, including details of covers etc, must be acceptable to the Works Engineer. A Commercial Agreement may also be required.

8.5 Provision of information

Relevant logs, test data and other field information must be submitted. The preferred format is paper, backed up by electronic (e.g. .pdf format) copies, as well as AGS data (current version).

Interpretative reports should be provided as a paper copy, together with electronic (e.g. Word or .pdf) version. All exploratory holes must be accompanied by a 12-figure national grid reference, as well as a level to Ordnance Datum.

Where it is not practical to provide levels to OD (for example where no benchmarks are present locally), then it may be acceptable to provide a relative level to an agreed datum (not water level), with a suitable witness drawing of any temporary benchmark used.

8.6 References

ICE (1993) 'Site Investigation in Construction Series 1 to 4', ICE Site Investigation Steering Group, Thomas Telford, London.

9 DEMOLITION

9.1 All work shall be carried out in accordance with BS 6187 Demolition, also in accordance with the Health and Safety Executive publications listed in the legislation and the COSHH regulations.

9.2 A full CDM statement will be agreed with the Works Engineer.

9.3 Demolitions adjacent to and over the canal shall be screened to ensure no detritus arising shall enter the canal or British Waterways' Property. Any debris, which does fall in, must be removed straight away. The canal bed shall be surveyed by dipping/diving/use of chains to locate isolated items etc. before and after the Works have been carried out and any remaining materials that have entered the waterway shall be removed.

9.4 A contaminated land assessment may be needed before work commences to assess the risks of contaminants leaching into the canal. The design and operation of the demolition works will need to take account of any risks identified. Guidance is given in the Environment Agency's Prevention of Pollution Guidance Note No 6, 'Working at construction and demolition sites'.

9.5 The passage of boats on the navigation shall be maintained unless otherwise agreed.

9.6 The use of explosives shall comply with the Home Office Regulations and shall only be permitted after full consultation with all relevant authorities including the Works Engineer.

9.7 British Waterways own and maintain many old structures, which could be adversely affected by excessive vibrations. Vibration predictions shall therefore be required, for approval by the Works Engineer, prior to the Works commencing. Agreement with the Works Engineer will need to be reached on acceptable frequency limits and the predicted Peak Particle Velocities. Monitoring during demolition shall be required to check these predictions. If damage to British Waterways structures does occur the Promoter shall be responsible for full immediate reinstatement to the Works Engineer's satisfaction. Consideration also needs to be given to nearby residents and the potential disturbance vibrations may have on wildlife.

9.8 Extreme caution needs to be taken when the removal of cellars is included in the clearance works. These are normally below water level and may well be retaining ground water, which is linked to the Waterway.

9.9 Historic structures alongside waterways, whether designated or not, may contain valuable archaeological information, or heritage features that should be preserved, rescued or recovered for future use. British Waterways should be allowed to assess and record the contents of the structure before demolition and to make first offer for any part of the structure which is if of value.

9.10 Buildings, especially when derelict, can be home to bats, birds and other wildlife, and consideration should be given to the need to protect them during the works. Bats and wild birds and their nests are legally protected and surveys to establish their presence are strongly recommended to avoid delays to the works.

10 MAINTENANCE

10.1 A Contract for access on to British Waterways' property, including airspace may be needed, unless there are agreements already in force, or the Promoter has statutory powers.

10.2 The Method Statement, Safety Statement and Temporary Works Drawings must particularly address the following:

- safety and convenience for boats and pedestrians - consider working at night, in the winter or from floating platforms
- if there are headroom constraints, which require the job to be done in two parts, relative to the waterway, the location of the channel must be determined, the temporary works designed accordingly and dredging carried out if necessary
- exclusion of deleterious matter from the waterway particularly:
    - lead based paint
    - chemicals and paint residues from graffiti removal
    - water & concrete from water jetting
    - grit from grit blasting (N.B. copper slag and silicon grit must not be used) - consider the use of grit blasting units with the waste removed immediately by suction to sealed containers.
- fendering
- vandalism
- scaffolding
- tubes must not project into the navigation / towing path airspace and must be cut off and capped
- scaffolding should not if possible rest on the canal bed; if this is unavoidable, large recoverable spreader plates must be used and settlement must be allowed for, and any damage to the canal lining made good
- consider boat impact loads
- fixing bolts should face away from the navigation
- it may be necessary to board out soffits etc. externally, where clearances are tight, for safety reasons
- access
- signs and lighting in accordance with the bye laws
- stability of floating platforms
- if longitudinal fabric dams are envisaged, fendering and the effect of boat propellers must be considered
- impacts of timing of works on wildlife that may be affected – for instance breeding or hibernation periods for animals and flowering seasons for plants
- impacts on adjacent valuable waterway habitats such as long grassland, reed-fringe, hedgerows etc.

10.3 Agreed methods of working must be communicated to sub-contractors.

10.4 The Promoter should check with the Environment Agency (Scottish Environment Protection Agency in Scotland) to see if consent is needed.

11 DIVING OPERATIONS

11.1 All diving operations in waterways under British Waterways control must be in accordance with the Diving at Work Regulations 1997 and the British Waterways Mandatory Standard – Diving Operations in BW Controlled Waters.

11.2 No individual or organisation, other than the Police/ Fire Brigade in support of an ongoing search or investigation, may conduct diving operations in waterways under the control of British Waterways without first seeking prior consent to do so.

11.3 Consent should normally take the form of an exchange of documents or letters that incorporates the issue of the hazard information as a drawing or summary and in some case may specify actions the promoter is required to take to meet the requirements of British Waterways.

11.4 Once consent has been granted to conduct diving operations and any separate arrangements for isolation of plant or equipment are completed, the responsibility for authorising or controlling the diving operation remains with the promoter or contractor, not with British Waterways.

11.5 A validated copy of the correspondence confirming consent to conduct diving operations must be available at the proposed worksite

11.6 British Waterways cannot accept any responsibility for providing hazard information to any diving activity that occurs without its prior knowledge.

11.7 British Waterways will request that any diving operation be ceased at the earliest opportunity - without compromising the safety of the diver or support team - where no prior knowledge of the activity has been provided or no documented proof of consent exists at the dive site.

12 HYDROPOWER AND LEISURE FACILITIES REQUIRING WATER ABSTRACTION

This section is applicable to navigable rivers where British Waterways is riparian owner and those navigation's identified in Statutory Instrument No 1195 *'The Inland Waterways of the British Waterways Board Order 1965'* as amended, and to other river navigation's leased to or managed by British Waterways at the time the scheme is proposed.

12.1 Power Generation by Hydropower

12.1.1 Introduction

British Waterways strongly supports the principle of generation of electricity from renewable sources. However their installation must not cause restrictions in the use of the navigation by craft, or affect the operation and maintenance of other structures owned or managed by British Waterways.

12.1.2 Procedure

- the Promoter provides initial information using the Notification Form (*Section4: Documents* Appendix 1), and submits a Costs Undertaking (*Section 4: Documents* Appendix 2) for the initial feasibility study stage
- the Promoter supplies an Outline Assessment, indicating proposed abstraction through hydropower plant, affect on water levels immediately above the weir, estimated length of backwater curve due to proposal, river depth survey over backwater length, schedule of mooring points and other structures affected
- British Waterways determines if engineering works, such as weir crest raising, flood relief sluices, alterations to flood locks, additional one off and routine dredging etc, will be required to mitigate the effects of the installation
- British Waterways and the Promoter discuss Commercial and Contractual matters
- the Promoter carries out a Detailed Hydrological Assessment if the Outline Assessment defines the need
- the hydrological and environmental aspects of engineering works are considered
- British Waterways assesses if the benefits of accepting the works required to structures and the navigation, and the restriction of water levels during the cruising season to minimum levels are likely to be sufficiently compensated by the Commercial Agreement and the benefits to the environment through reduction of greenhouse gasses
- a decision is then made as to whether or not the proposal is to proceed further
- the Promoter provides evidence of application for Abstraction and discharge consent from the Environment Agency or Scottish Environment Protection Agency; if applicable an Impounding Licence may also be required for weir raising works
- British Waterways discusses with the Environment Agency or Scottish Environment Protection Agency the Abstraction and Discharge consent conditions, and the Impounding Licence if consent is required
- if everything is in order and if the benefits of accepting the proposal outweigh the impacts proceed to Contract
- the Promoter provides Risk Assessments and Method Statements for Works affecting the navigation
- construct Works
- maintain Works for duration of agreement and consents
- remove or seal up and return weir to pre-works level unless a permanent Impounding Consent is in place.
-

12.1.3 Feasibility and Design

12.1.3.1 The feasibility study will have to demonstrate the loss of water level at the weir due to the proposed abstraction of the hydropower plant, the extent of the backwater curve where river levels are affected. The changes in flow down the river channel will need to be assessed by surveying the full bed profile of the river over the affected length to determine whether sections will still be navigable due to lack of depth or races forming. (It must be understood that if river levels are lower due to passing most of the river flow through a hydropower plant instead of over a weir, then larger volumes of water than before must pass through a smaller cross-section in the river channel, and this can cause serious problems to craft navigating the river).

12.1.3.2 British Waterways is not obliged to accept a lowering of water levels as although craft are often affected for short periods in the summer when river flows are insufficient to supply adequate navigable depth, this is accepted by the skippers as purely due to adverse weather conditions. A hydropower installation is capable of holding river level at or below what would be seen as drought levels for most of the cruising season.

12.1.3.3 Abstractions from above the weir and discharges below it will require consent from the Environment Agency or the Scottish Environment Protection Agency. The Promoter will be responsible for obtaining any necessary consent and providing proof to the Works Engineer that this has been done. It must not be presumed that Environment Agency consent confers British Waterways consent or vice versa.

12.1.3.4 Works may be required to lift water levels back to acceptable levels defined by British Waterways, and these will have to be designed by the Promoter. Should this require raising of the weir an Impounding Licence may be required from the Environment Agency or the Scottish Environment Protection Agency, and if so, the Promoter will be responsible for obtaining the necessary consent and providing proof to the Works Engineer that this has been done. Any such raising works must be designed to be easily reversible.

12.1.3.5 If the weir crest cannot be raised sufficiently, or at all, due to increased flooding risk, it may be possible to mitigate the loss of water depth by appropriate initial and later maintenance dredging at the Promoter's expense. Should funding for later maintenance dredging be unavailable when required, the hydropower plant must be restricted in abstraction or closed down, until the required dredging is completed.

12.1.3.6 The nature of the way the hydropower station starts up and shuts down must be considered to avoid rapid changes in water level. Ideally the installation should be designed to maintain constant water levels, rather than maximum generation with periods of shut down whilst levels recover before the plant restarts again working at maximum capacity.

12.1.3.7 Abstractions should ideally be protected by any existing weir navigation protection boom. Where the abstraction is upstream of the boom consideration should be given to either re-locating the boom, or installing additional protection to the inlet structure. The structure must be designed such that craft in the navigation channel passing the inlet do not experience flows towards the inlet greater than 0.3 metres per second at 90^0 to the navigation.

12.1.3.8 If the discharge outlet is adjacent to the navigation channel, in order to minimise navigational difficulties associated with transverse flows of water the discharge energy must be minimised in the discharge structure design. The structure must be designed such that craft in the navigation channel passing the outlet do not experience flows away from the outlet greater than 0.3 metres per second at 90^0 to the navigation.

12.1.3.9 At locations where craft will be manoeuvring at low speed this velocity of abstraction and discharge will be reduced in proportion to the reduction in craft speed. The Works Engineer will specify the craft speed. A stilling basin may be needed to comply with this requirement.

12.1.3.10 In all cases where craft may be affected, mathematical modelling will be required to indicate flow paths at various river flows, with and without the power plant in operation. In some cases physical modelling may be necessary, and if experience after commissioning implies the modelling to have been incorrect the actual flows on site will have to be determined at the Promoter's expense. Should the actual flows prove to be adversely, and significantly different to those predicted the plant must be restricted in capacity or closed down, until appropriate modifications are implemented and shown to be acceptable.

12.1.3.11 Scour protection may be needed, and any existing fish pass structures may have to sealed off and replaced with a new structure adjacent to the power plant, as the noise will attract the fish. Any such sealing off shall be designed to be easily reversible. The installation must be designed to minimise death and injury to fish stocks in the river.

12.1.3.12 Hydropower structures should be designed to minimise the visual impact on the waterway, and they should be as quiet in operation as possible, with noise shields installed where residential properties or craft are nearby. The structure should be safely accessible for maintenance and access over or through the structure to the weir by British Waterways and the emergency services.

12.1.3.13 The Promoter must supply a drawing and method statement detailing the de-commissioning phase of the installation. This can be complete removal and reinstatement of the riverbanks, abutment shoulder, fish pass, etc, or sealing up and back filling of underground elements and removal of above ground structures. Sufficient detail is required to enable British Waterways to carry out this work in the event of the Promoter or his or her successors being unavailable or financially unable to carry out this phase of the works.

12.1.4 Operation & Maintenance

12.1.4.1 It is unlikely that British Waterways will accept mechanised operating structures owned by others, installed on or in existing weir structures, such as motorised control of existing sluices, adjustable crest etc due to the difficulty of determining future maintenance responsibilities and assignment of risk.

12.1.4.2 Should works be essential to allow the scheme to be progressed, such as a weir crest raising, sealing up of fish pass etc, this will be carried out by British Waterways at the Promoter's cost. A charge will be made for the additional maintenance costs whilst the plant is in commission. The additional removal of the works at the end of the agreement will also be the Promoter's responsibility.

12.1.4.3 Following completion of such works British Waterways will own them, and will maintain them for the length of the agreement, removing and unsealing them on closure of the hydropower station, if required by the Environment Agency.

12.1.4.4 It is essential that arrangements are in place to allow British Waterways to access its weir structure for maintenance and inspection. Should security fencing be required to protect the hydropower station and this prevents access to the weir, British Waterways must be provided with a key.

12.1.4.5 Principal and Special Inspections of the weir may require it to be dewatered, and this would normally be done by localised stanking off, or by lowering of the river level via sluices or other draw-off structures controlled by British Waterways. If possible arrangements should be in place between British Waterways and the Promoter such that in suitable weather conditions the power plant can be used to de-water the weir to allow quicker and less disruptive access. The Promoter must allow within his or her business plan for interruptions in power generation due to inspection works and any future maintenance works to the weir by British Waterways.

12.1.4.6 Grilles may be needed to prevent debris entering the installation. Debris removed from the grills should be disposed of promptly at the Promoter's expense and not left on the waterway side. It

will not be acceptable to place debris removed from the grill back into the water either upstream or downstream of the works.

12.2 Leisure Facilities Requiring Water Abstraction

12.2.1 Introduction

12.2.1.1 Leisure facilities relying on abstraction of river water are acceptable in principal to British Waterways, as long as the principles in section 12.1 for hydropower installations are complied with, together with the items below, and the benefits outweigh the impacts of the scheme. These commonly include canoe slalom and white water rafting courses, and have a very similar affect on the Navigation to hydropower generation schemes.

12.2.1.2 The quality of water and the continuity of supply cannot be guaranteed. Information regarding typical water quality can be supplied. It may be that the water quality at a location rules out its use for such leisure purposes.

12.2.1.3 Where such facilities are built and they require canoes, rafts etc to be returned to the head of the facility to re-enter the course, suitable portage routes must be built that do not conflict with other users of the waterway. It is unlikely to be acceptable to use the towpath or to paddle such craft back through a lock.

12.2.1.4 This type of facility must have a control structure capable of regulating flows down the course, and of closing it down completely when required, Flows shall be stopped or left at minimal levels when the facility is not in use or water supplies are restricted by weather conditions.

12.2.1.5 At all times the Navigation will have priority in use of available water and the minimum river flows and upstream water level will be set by British Waterways, below which the facility may not be operated. A graph of maximum abstractions against available river flow will also be agreed with the Promoter, together with rates of change of abstraction to minimise the adverse effects on the Navigation.

13 MAXIMUM LOAD APPLICATION ON TOWPATH

13.1 Loading rule

The load applied to the towpath shall not exceed 1.5 tonnes and not be applied within 1.5 m measured from the face of the canal wall (the coping stone) or at a distance determined by the '45° edge distance rule', whichever the greater.

In all cases the suitability of the towpath for load bearing must be confirmed with the Works Engineer.

The load is a mass spread over the footprint of the equipment, machinery (plant) and stored materials. Loads shall be spread in all cases as best practically possible. There shall be no load application to utilities and utility troughs. Utilities, typically telecommunication and power cables, are superficially buried in the towpath. These utilities may also be installed in cable troughs identifiable by the covers made of concrete slats and concrete panels.

Although no superficial load shall be applied to utilities and utility troughs and given that there is no alternative method of working a relaxation of the prescription will be considered if it is demonstrated that the effect of the spread load does not exceed the safe carrying capacity of cable trough covers. There shall be no load application to buried cables.

The loading rule is not to be interpreted that multiple loads of maximum 1.5 tonnes can be applied. It should be understood as a single load not exceeding the maximum load limit.

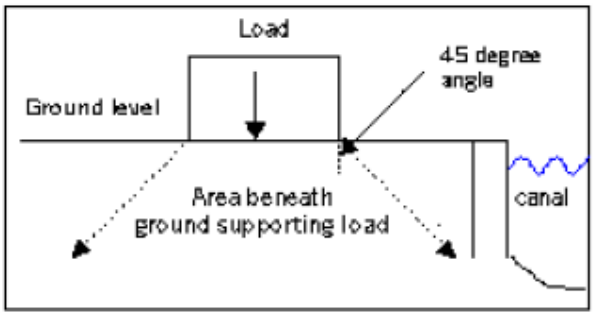
The loading rule applies to all load application including the following:

- Plant amongst others excavators, tippers, loaders, bowsers, crawling wheelbarrows, lawn mowers[1]
- Vehicles amongst others passenger and light duty vehicles
- Equipment amongst others generators, pumps
- Temporarily stored materials amongst others excavated earth, stockpiles, water in tanks
- Scaffolding
- Other

13.2 45º edge distance rule

The minimum distance horizontal distance is determined equal to the depth of the canal.

Figure 1: Illustrating the 45° edge distance rule



[1] Lawn mowers of the ride-on type need to move close to the canal edge. The vehicle shall not exceed a loaded mass of 0.3 tonnes. Care should be taken not to ride on the coping stone. The coping stone should not be taken to be structurally suitable for load bearing.

13.3 Excessive loads

Loads in excess of 1.5 tonnes are deemed excessive and require a detailed specific assessment by the Works Engineer.

13.4 Access to the towpath

Access by plant and vehicles, as moving onto and along the towpath is not permitted without express authorisation by the Works Engineer. A schedule of the loads accompanied by the plant manufacturer's specifications to own mass, mass carrying capacity, footprint, overall and extended dimensions, turning and operating radii, and similar salient information; should be attached to the method statement.

13.5 Working on the towpath

The working area which includes the area along which access is gained shall be isolated to separate the works from the towpath users. Specification for hoarding and fencing should be given in the draft hoarding and towpath closure method statements.

General Considerations for site access

- Safe access onto and around the site for personnel and vehicles
- Separation of towpath users from the construction activities
- Isolated loading and unloading areas
- Parking and manoeuvring places including area to turn round or one way system
- Need for a banksman to assist reversing vehicles
- Adequate site lighting
- Means of stopping rolling vehicles such a vehicle barriers
- Maintaining areas clear of stored materials
- Protection of overhead cables
- Protection of underground services.

13.6 Assessing risk

Requirements for all vehicles and ride-on equipment used on towpaths

- Risk assessment is required to be carried out prior to use of all ride-on equipment, vehicles etc.
- All plant etc used on the towpath must have at least two means of escape from the cab. If not then plant is not suitable for use on the towpath
- The effect of vibration cause by the machinery and plant
- Effect of change of water level in the canal. Obtain historical data on water level
- Assessment extends to the needs for public access on towpaths to private or leased property.

14 SCAFFOLDING REQUIREMENTS

14.1 Introduction

14.1.1 When working on - or adjacent to British Waterways' property it more often than not presents a challenge in erecting and maintaining a scaffold in the unique environment. These guidelines provide information to assist in overcoming these challenges which are not usually encountered when designing and erecting scaffolding.

14.1.2 This guide is to be read in conjunction with the British Waterways Code of Practice, HSE standards and the British Standards for scaffolding, in particular:

- BS 5973: 1990 Code of practice for access and working scaffolds
- BS 5974: 1990 Temporarily installed suspended scaffolds and access equipment
- BS 1139: (Tubes)
- BS 2482: 2009 Specification for timber scaffold boards
- BS EN 12811-1 / TG 20:08
- CIRIA C686 2009 Safe access for maintenance and repair
- Regulations 6 and 7 of CHSW 1996 - Construction Health Safety and Welfare Regulations
- LBS Appendix C, The Work at Height Regulations 2005
- LOLER 1998 (Lifting Operations and Lifting Equipment Regulations)
- Provisions and Use of Work Equipment Regulations (PUWER)1992
- PPE (Personal Protective Equipment) Regulations 1992
- Manual Handling Regulations 1992
- NASC SG4:05 – National access and scaffolding convention guidance notes
- English Heritage – Scaffolding relating to historic structures.

14.2 General

Tubes must not project into the navigation/towing path airspace and must be cut off and capped. Where possible, the scaffolding should not rest on the canal bed or the edge of the towpath/canal wall. The coping stone should not be taken to be structurally suitable for load bearing. Also consider the implications of boat impact loads and provide suitable fendering.

14.2.1 Fixing bolts should face away from the navigation and towpath and where clearances are tight, it may be necessary to board the underside of the scaffolding to provide a flush soffit.

14.3 Clearances

14.3.1 Width on towpath: 1.0 m minimum clearance between standards for pedestrian access in single file. That will be where the metre run of scaffold on the towpath is 10 m or less. For runs of scaffold over 10 m it likely that towpath users will need to pass each other beneath the scaffold. Therefore minimum width will need to be increased to 1.5 m. In both cases a row of standards is between the pedestrian and the canal edge. The standards are so adapted to form a handrail or suitable barrier to the canal.

14.3.2 Where there is no row of standards between the pedestrian and the canal the minimum width is increased to 2.0 m in all cases.

14.3.3 Width on navigation: A minimum clearance must be agreed with the Works Engineer. Normally this will allow 2 boats to pass safely side by side, and will vary depending on the canal or navigation crossed.

14.3.4 Height above towpath: Minimum 2.60 m clear headroom must be maintained along the length of the scaffolding.

14.3.5 Height above navigation: A minimum clearance must be agreed with the Works Engineer above normal water level, this will vary depending on the canal or navigation crossed.

14.4 Fendering

14.4.1 Where the scaffolding is in such a position that boat impact could arise, then a suitable protective and deflecting fender must be placed around the scaffolding. As craft can be affected by winds and currents, provision of a wide navigation channel is not enough in itself to remove the need for fenders.

14.4.2 The design of the fendering should take into account any likely changes in water levels, particularly to river navigations.

Figure 2: Containing the environment inside of the scaffold

Figure 3: Fendering as protection to the scaffold from boat impact

14.5 Protection

14.5.1 When scaffolding is on the tow path, the standards and approach ledgers should be open wrapped with red/white barrier tape to heighten visibility. Suitable lighting arrangements should also be in place.

Figure 4: Scaffold tunnel on towpath

Figure 5: Scaffold tunnel on towpath

14.5.2 The first boarded lift should be double boarded with polythene membrane sandwiched between boards. Where there is a possibility of materials/debris falling from scaffold then debris netting must be fitted.

14.5.3 In special circumstances this may be reduced to brick guards. Please also ensure that on this first lift no materials/debris can fall between the scaffold and the face of the building.

14.6 Founding off the canal bed

14.6.1 When standards are founded off the canal bed, if the water cannot be lowered sufficiently to place large spreader plates beneath each standard, then a suitable arrangement would be to double clip a 600 mm long piece of scaffold tube to the bottom of each standard. This would allow the standard to penetrate any silt but not damage the original lining of the canal. Any damage to the lining which results must be repaired to the Works Engineer's satisfaction.

14.6.2 Suitable buffers and fenders shall be provided to guide vessels into the diversion. Fenders and their supports are designed to resist the impact of a 40 tonne barge travelling at 4 mph.

The fender is installed at an angle of 30° to 45° to the canal wall and will direct the craft on collision towards the centre of the canal. The fender level is the same as that of the towpath side coping stone or between 300 mm and 500 mm above the water level.

14.7 Additional Signage

In addition to the signage requested within *Section 2: Code of Practice*, whenever the scaffold can be reached from the water, it would be prudent to place '**WARNING – DO NOT TIE BOATS TO THE SCAFFOLD**'

14.8 Scaffold Charges

14.8.1 Where scaffolding is permitted and erected either on or over British Waterways' property, appropriate charges will be levied.